

What is claimed is:

1. An abrasive alloy comprising

a material with a hardness over 20 GPa in combination with from about 5 vol. % to about 30 vol. % of a ductile binder phase of Co-Mn alloy.

2. The abrasive alloy of claim 1 wherein the material with a hardness over 20 GPa is selected from the group consisting of BN (cubic), SiC, Al₂O₃, TiB₂, WC, TiC, AlB₁₂, Si₃N₄, AlMgB₁₄, Al_zSi_{1-z}MgB₁₄, AlCr_zMg_{1-z}B₁₄, AlTi_zMg_{1-z}B₁₄ and AlMgB₁₄X where X is present in an amount of from 5 wt. % to 30 wt. % and comprises a doping agent from the group consisting of Group III, IV, V elements and borides and nitrides thereof and where $1 \geq z \geq 0$.

3. The abrasive alloy of claim 1 wherein the ductile binder phase is from about 10 vol. % to about 20 vol. % of a ductile binder of Co-Mn alloy.

4. The abrasive alloy of claim 1 wherein the ductile binder phase of Co-Mn alloy ranges from Co-5% (atomic) Mn alloy to Co-45% (atomic) Mn alloy.

5. The abrasive alloy of claim 4 wherein the ductile binder phase of Co-Mn alloy ranges from Co-17 % (atomic) Mn alloy to Co-38 % (atomic) Mn alloy.

6. A method of making an abrasive alloy, comprising:
providing a material with a hardness over 20 GPa in powder form;
providing a ductile binder phase of Co-Mn alloy in powder form;
mixing the two powders together;

compacting the powders;
sintering the powders; and
cooling the product.

7. The method of claim 6 wherein the material with a hardness over 20 GPa is selected from the group consisting of C (diamond), BN (cubic), C_3N_4 (cubic), SiC, Al_2O_3 , TiB_2 , WC, TiC, AlB_{12} , Si_3N_4 , $AlMgB_{14}$, $Al_zSi_{1-z}MgB_{14}$, $AlCr_zMg_{1-z}B_{14}$, $AlTi_zMg_{1-z}B_{14}$ and $AlMgB_{14}X$ where X is present in an amount of from 5 wt. % to 30 wt. % and comprises a doping agent from the group consisting of Group III, IV, V elements and borides and nitrides thereof and where $1 \geq z \geq 0$.

8. The method of claim 6 wherein the ductile binder phase is from about 10 vol. % to about 20 vol. % of a ductile binder of Co-Mn alloy.

9. The method of claim 6 wherein the ductile binder phase of Co-Mn alloy ranges from Co-17 % (atomic) Mn alloy to Co-38 % (atomic) Mn alloy.

10. The method of claim 6 wherein densifying and sintering are performed simultaneously.

11. The method of claim 10 wherein the sintering temperature is from 800°C to 1400°C with applied pressure.

Cook

Attorney Packet No. P05820US01

12. The method of claim 6 wherein the sintering temperature is over 1300°C without applied pressure.

13. A ceramic material comprising an orthorhombic boride selected from the group consisting of $\text{AlCr}_2\text{Mg}_{1-z}\text{B}_{14}$, $\text{AlTi}_2\text{Mg}_{1-z}\text{B}_{14}$ and $\text{Al}_2\text{Si}_{1-z}\text{MgB}_{14}$.